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IS 3513-3 (1989): Resin Treated Compressed Wood Laminates (Compregs) - Specification, Part 3: For General Purposes [CED 20: Wood and other Lignocellulosic products]



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“Knowledge is such a treasure which cannot be stolen”

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IS 3513 (Part 3) : 1989

(Reaffirmed 2003)

REAFFIRMED

2008

Indian Standard

**SPECIFICATION FOR
RESIN TREATED COMPRESSED WOOD
LAMINATES (COMPREGS)**

PART 3 FOR GENERAL PURPOSES

(*First Revision*)

First Reprint JUNE 2000

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♻️ BIS 1989

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

AMENDMENT NO. 1 JUNE 2005
TO
IS 3513 (PART 3) : 1989 SPECIFICATION FOR
RESIN TREATED COMPRESSED WOOD LAMINATES
(COMPREGS)

PART 3 FOR GENERAL PURPOSES

(First Revision)

(Page 3, clauses 7.1 and 7.1.1) — Substitute the following for the existing:

‘7.1 Boards

The dimensions of resin treated compressed wood laminate boards shall be as follows:

Length in mm : 2 400, 2100, 1 800, 1 500, 1 200, 900 and 600

Width in mm : 1 200, 900, 600, 300 and 150

NOTE — Any other dimension as agreed to between the manufacturer and the purchaser may also be used.’

(Page 4, clause 7.1.2) — Renumber the clause and substitute the following for the existing:

‘7.1.1 Thickness

Unless otherwise specified the thickness of resin treated compressed wood laminate boards shall be 3 mm, 4 mm, 5 mm, 6 mm, 8 mm, 12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 60 mm and 70 mm.’

(Page 4, clause 7.1.3) — Renumber the clause and substitute the following for the existing:

‘7.1.2 Tolerances

The tolerance on the nominal sizes of finished boards shall be as follows:

Amend No. 1 to IS 3513 (Part 3) : 1989

<i>Dimensions</i>	<i>Tolerance</i>
Length	+6 mm -0 mm
Width	+3 mm -0 mm
Thickness:	
i) Less than 6 mm	±10 percent
ii) 6 mm and above	±5 percent
Edge straightness	2 mm per 1 000 mm or 0.2 percent
Squareness	2 mm per 1 000 mm or 0.2 percent

**AMENDMENT NO. 2 DECEMBER 2008
TO
IS 3513 (PART 3) : 1989 SPECIFICATION FOR RESIN
TREATED COMPRESSED WOOD LAMINATES
(COMPREGS)**

PART 3 FOR GENERAL PURPOSES

(First Revision)

(Page 2, clause 5.2) — Substitute the following for the existing:

'The synthetic resins used for impregnation and bonding of veneers shall be of phenol or cresol formaldehyde type and the resultant resin adhesive shall conform to the requirements specified in IS 848 : 2006.'

(Page 6, Annex A) — Substitute the following for the existing as appropriate and delete 'IS 303 : 1975' and its corresponding title from the list:

'IS 848 : 2006 Synthetic resin adhesives for plywood (phenolic and aminoplastic) — Specification (*second revision*)'

(CED 20)

FOREWORD

This Indian Standard (Part 3) (First Revision) was adopted by the Bureau of Indian Standards on 22 April 1989 after the draft finalized by the Wood Products Sectional Committee had been approved by the Civil Engineering Division Council.

Resin treated compressed wood laminates, also known as compregs, are laminates made from thin wood veneers and thermosetting phenol or cresol formaldehyde resins. They combine within themselves enhanced mechanical properties with the stabilizing and moisture-proof qualities of thermosetting resins; besides, they have good machining properties, and resistance to corrosive agents and termite attack. Compregs are manufactured in different shapes, such as, sheets, rods and moulded shapes.

Uses of compregs for general purposes cover general engineering, textile and jute industry. In atomic energy plant installations, compregs are finding increasing use as neutron shielding material.

In the textile and jute industry, compregs are used for making textile machinery components, such as, picking sticks for looms engaged in weaving carpets, jute, wire, heavy woollens, etc; for slay bases to eliminate metal reinforcement, for race boards to permit very smooth shuttle action; and for swells, picking levers, stick wedges, beam flanges, shuttle pins, shuttles, etc. In the field of tool engineering, compregs are used for silent gears, spinning chucks and also for several kinds of tools used in aircraft, automobile and general industries; rubber press-dies, forming and drawing tools for parts of complicated nature, piercing and blanking tools with cutting details made from the usual hardened steel parts; jigs, assembly equipment, etc, are also increasingly made from compregs.

The grading of compregs is based upon the extent and nature of impregnation of the resin-forming chemicals, and also upon the compression and density as a result of pressure applied for curing and binding whereas the different types in each of the grades indicate the arrangement of the veneer and therefore, relative orientation of wood fibre in various directions.

The dimensions of compreg boards and rounds have not been covered exhaustively as these vary widely depending upon end-use. However, for general guidance, certain stock dimensions have been indicated.

This standard was first published in 1966. In the present revision, the requirements of various properties of compregs have been revised keeping in view the latest developments in the industry and the feedback from the users.

This standard is now published in four parts, namely,

Part 1 For electrical purposes

Part 2 For chemical purposes

Part 3 For general purposes

Part 4 Sampling and tests.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (revised)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

**SPECIFICATION FOR
RESIN TREATED COMPRESSED WOOD
LAMINATES (COMPREGS)**

PART 3 FOR GENERAL PURPOSES

(First Revision)

I SCOPE

1.1 This standard (Part 3) covers requirements of resin treated compressed wood laminates (compregs) for general purposes.

1.2 This standard does not cover the requirements for solid compressed wood.

2 REFERENCES

2.1 The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 TERMINOLOGY

3.1 For the purpose of this standard, definitions given in IS 707 : 1976 and the following shall apply.

3.2 Compreg

A wood-base laminated material made from thin wood veneers either impregnated under vacuum and/or pressure with synthetic resins or coated with synthetic resin or interlaid with synthetic impregnated paper and further bonded and densified under heat and pressure. The synthetic resins are usually of phenol and cresol formaldehyde type.

3.3 High Density Compreg

Compreg with specific gravity between 1.25 and 1.35.

3.4 Medium Density Compreg

Compreg with specific gravity between 0.95 and 1.25.

4 GRADES AND TYPES

4.1 Grades

General purpose compreg shall be of two grades:

- a) High density
- b) Medium density

4.1.1 General Purpose High Density Grade (or Grade GH)

This shall be a partially impregnated high density material suitable for textile and jute mills accessories and tools, engineering and general engineering applications. This grade shall have four types, namely, Type II, III, V and VI.

4.1.2 General Purpose Medium Density Grade (or Grade GM)

This shall be a partially impregnated medium density material suitable for general purposes. This shall have four types, namely, Type II, III, V and VI.

4.2 Types

4.2.1 The types of general purpose compreg of both high density and medium density grades shall be as follows:

- a) *Type II* — In this type, the grain orientation of the constituent veneers shall be more than 75 percent in the direction of the major mechanical stress. Every fourth veneer comprising this type shall have its grain direction at right angle to the grain direction of adjacent three veneers which will have their grain in the same direction.

The mechanical properties achieved in this type are generally comparable to Type V but the cross lamination gives improved resistance to splitting. This arrangement is specially suitable for tensile links where the end fixings are in the form of bolts or rivets located close to the end of the components.

- b) *Type III* — In this type, the grain orientation of the constituent veneers shall be approximately equal in all radial directions. This type shall have each successive lamination angularly disposed in relation to the adjacent one.

This type is suited for fabrication of gears, chuck and wheels.

- c) *Type V* — In this type, the grain orientation of the constituent veneers shall be in the direction of the axis of load.

This type is suitable for parts subject to tensile stress and is thus suited for fabrication of sticks, flats, rods, turn-parts and threading.

- d) *Type VI* — In this type, the grain orientation of the constituent veneers shall be more or less equal in each axis and at right angles to each other.

This type is of high compressive strength in the direction of its thickness and is also rigid. It is suited for sheet and block forms.

4.2.2 Typical sketches illustrating the direction of grains of the veneers in the assembly for various types are indicated in Fig. 1.

5 MATERIALS

5.1 Timber

Any non-resinous species of timber may be used for the manufacture of veneers required for making compreg.

5.1.1 The veneers shall be either rotary cut or sliced and maximum variation in grains shall not exceed 1 in 10. It shall be smooth, free from knots, splits, dry rot or any other type of rot, and resin pockets. The veneers shall be of uniform thickness with a tolerance of ± 5 percent and dried to a suitable moisture content not exceeding 8 percent.

5.1.2 In selecting the species for the manufacture of compreg, it is recommended that, as far as possible, a single species of timber be used in a

pack and where combination of different species is unavoidable, care shall be taken to prevent incompatibility of various species in physical and mechanical properties, such as, density, modulus of elasticity, shrinkage, etc.

5.2 Synthetic Resins

The synthetic resins used for impregnation and bonding of veneers shall be of thermosetting phenol or cresol formaldehyde type and shall generally conform to IS 848 : 1974.

5.3 Varnishes

Varnishes used for treating compreg boards and the machined components of compreg shall conform to IS 524 : 1983 and IS 525 : 1968 (*see also 6.8*).

6 MANUFACTURE

6.1 The constituent veneers of compreg of general purpose grades in high and medium densities shall be manufactured in accordance with 6.1 of IS 3513 (Part 1) : 1982 except that the impregnation is partial which shall be achieved either by spreading the resin on to the veneers by a suitable coating machine, an alkali catalyzed thermosetting phenol or cresol formaldehyde resin or by interleaving between the veneers, phenol or cresol formaldehyde impregnated paper film having the requisite quantity of resin content.

6.2 The density of the material shall be varied by varying the amount of impregnation and the pressure. Prior to pressing, the veneer packs should be built up to pre-determined thickness and then pressed down to a pre-determined final thickness in the hydraulic press usually provided with thickness stoppers. The packs may be weighed before pressing to ensure the required final density.

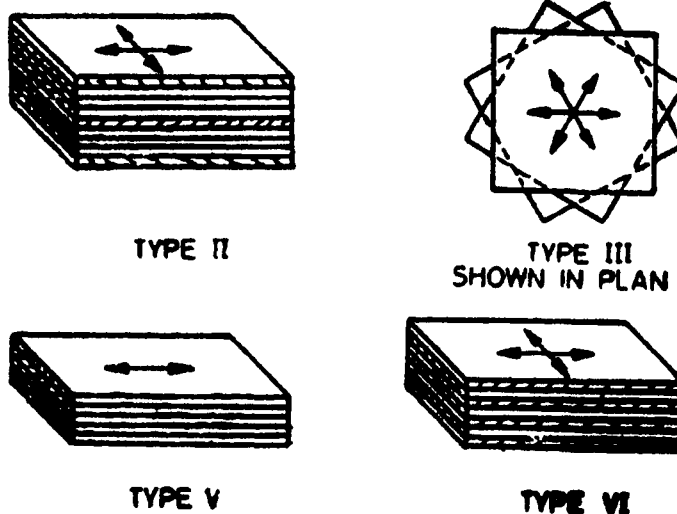


FIG. 1 TYPES OF COMPREG SHOWING ARRANGEMENT OF LAMINAE

6.3 Compreg for general purposes shall be manufactured in such a way that the following conditions are satisfied:

Grade	Synthetic Resin	Impregnation Method	Resin Pick-up on Oven Dry Basis, Percent	Curing Temperature °C	Curing and Bonding Pressure Range, MP
GH	Alkali catalysed phenol or cresol formaldehyde resin or phenol formaldehyde	Coating or inter-leaving with fibre of required resin content	10 to 40	135 to 150	7.0 to 15.5
GM	do	do	do	do	4.2 to 8.5

6.4 The thickness of veneers for the manufacture of compreg shall be 0.7 to 2.0 mm. The thickness of individual veneers shall not vary beyond ± 5 percent of the average thickness.

6.4.1 The veneers required to be dge-jointed shall be so done on a tapeless splicer and no staples or tapes shall be used. The adhesive used for splicing should be compatible with phenol or cresol formaldehyde resins to be later used for impregnation and bonding.

6.4.2 Where in an assembly, different species are used, care shall be taken to see that they are not incompatible and that they are balanced around the central axis (see also 5.1.2).

6.4.3 In one pack, usually veneers of same thickness shall be used except where adjustment is to be made for density; but in case different thickness are used, these shall be balanced around the central axis.

6.4.4 The veneers of one pack shall be cut by the same method, that is, either rotary cut or sliced. If cut by different methods, these should be assembled so that these balance around the central axis.

6.5 The compreg boards after discharge from the press, shall be kept for a minimum period of one week to normalize internal stresses and then they shall be cut to the required sizes and finished.

6.6 The resins used shall have no fillers or extenders. A suitable modifying agent may be used to impart the required special properties to the board.

6.6.1 When the thickness of the board required exceeds the thickness the press can accommodate, it may be obtained by glueing two or more boards using similar and compatible resin as that used for impregnation and bonding with the prior approval of the purchaser.

6.7 A purchaser ordering machined components, shall provide the necessary drawings giving details as to the dimensions of the components and tolerances and the components shall be supplied in accordance with the drawings.

6.8 The edges of all the boards and the surfaces of all components shall be given a protective coat with suitable insulating varnish conforming to the relevant Indian Standards, that is, IS 524 : 1983 and IS 525 : 1968 (see also 5.3).

7 DIMENSIONS AND TOLERANCES

7.1 Boards

The dimensions of platten finished compreg boards shall be quoted in the following order:

The first dimension shall represent the length, that is, the dimension parallel to the grain of faces; the second, the width, that is, the dimension at right angle to the grains of faces and the third, the thickness.

7.1.1 Size

The stock sizes for compreg boards shall generally be the following:

mm		mm
2 100	×	1 200
2 100	×	900
1 800	×	1 200
1 800	×	900
1 500	×	1 200
1 500	×	900
1 500	×	600
1 500	×	300
1 500	×	150
1 200	×	1 200
1 200	×	600
1 200	×	300
1 200	×	150
900	×	900
900	×	600
900	×	300
900	×	150
600	×	600
600	×	300
600	×	150

7.1.2 Thickness

The preferred thicknesses of compreg boards shall be 3, 4, 5, 6, 8, 10, 12, 16, 20, 25, 32, 40, 50, 60 and 70 mm.

7.1.3 Tolerances

The following tolerances on the nominal size of finished compreg boards shall be permissible:

<i>Dimension</i>	<i>Tolerance</i>
a) Length	+ 6 mm - 0 mm
b) Width	+ 3 mm - 0 mm
c) Thickness	
less than 6 mm	± 10 percent
6 mm and above	± 5 percent

7.2 Rods

The sizes for round rods of compreg shall generally be the following:

<i>Length</i> mm	<i>Diameter</i> mm
1 500	8 to 50
1 200	3 to 50
900	50 to 80
600	6 to 40

7.2.1 Compreg rods of longer lengths and intermediate or greater diameter may be manufactured according to the requirements of the purchaser.

7.2.2 The tolerance on diameters of compreg rods shall be as follows:

Rods up to and including 40 mm dia	0 mm - 0.20 mm
Rods 50 mm dia, and above	0 mm - 0.25 mm

7.3 The purchaser ordering compreg cut to special size and shapes, such as, round discs, rings and gear blanks to any required taper or finished parts shall provide the necessary drawings specifying material, dimensions and tolerances, and the supplies shall be according to the drawings of the purchaser.

7.3.1 Tolerances on finished components or blanks shall be in accordance with the drawings of the purchaser.

8 PHYSICAL AND MECHANICAL PROPERTIES

8.1 The physical properties of compreg for general purposes for all types shall conform to Table 1 when tested by the methods specified therein.

8.2 The mechanical properties for Type V and Type VI shall conform to Table 2.

9 WORKMANSHIP AND FINISH

9.1 When supplied in board form, the face and back of a board shall be free from checks, splits, blisters, discolouration, overlaps, gaps and open joints, and the boards shall be free from warp.

9.2 Compreg boards may be either platten finished, or machine finished.

9.2.1 The machine finished boards shall be given a protective coat of varnish as required by the purchaser. Usually the edges of the boards shall be given a coat of protective varnish.

10 SAMPLING

10.1 Sampling shall be as in IS 3513 (Part 4) : 1966.

11 TESTING

11.1 Test specimens, cut from each of the boards, selected shall be tested by the appropriate methods specified in appropriate tables and IS 3513 (Part 4) : 1966.

Table 1 Physical Properties, All Types
(Clause 8.1)

Sl No.	Test	Requirement		Method of Test
		Grade GH	Grade GM	
(1)	(2)	(3)	(4)	(5)
1	Specific gravity	1.25 <i>Min</i> 1.33, <i>Max</i>	0.95, <i>Min</i> 1.25, <i>Max</i>	IS 1708 (Part 2) : 1966
2	Moisture content and volatile matter	6 to 12 percent	6 to 12 percent	IS 1708 (Part 1) : 1966

Table 2 Mechanical Properties
(Clause 8.2)

Sl No.	Test	Requirement				Method of Test
		Type V GH	Type VI GH	Type V GM	Type VI GM	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	Tensile strength, MPa, <i>Min</i>	155	90	108	59	IS 1734 (Part 9) : 1983
2	Static bending strength, MPa, <i>Min</i>	145	100	88	59	IS 1998 : 1962
3	Compressive strength (Specimens 20 mm × 20 mm × 20 mm)					
	a) Parallel to laminae, MPa <i>Min</i> ,	130	90	55	75	IS 1708 (Parts 8 & 9) : 1986
	b) Perpendicular to laminae, MPa, <i>Min</i>	70	160	70	130	
4	Shear strength, MPa, <i>Min</i>	14	14	—	—	IS 1708 (Part 11) : 1986
	a) Parallel to grain and laminae (edgewise)					
	b) Perpendicular to grain and perpendicular to laminae (flatwise)	60	45	—	—	
5	Hardness (Rockwell 'H' Scale), <i>Min</i>	—	80	—	60	IS : 1586 : 1988
6	Impact strength (unnotched sample), kg m/cm ² , <i>Min</i>					
	a) Perpendicular to laminae	—	0.3	—	0.2	IS : 1998 : 1962
	b) Parallel to laminae	—	0.5	—	0.5	

11.1.1 When testing for tensile strength according to IS : 1734 (Part 9) : 1983, care shall be taken that the sample represents the full board. In case of board, thicknesses being less than the maximum thickness the gripping jaw of the machine is capable of holding, the samples shall be cut incorporating the whole thickness of the board. In case thickness of board is more than the maximum the machine jaw is capable of holding, three sets of samples shall be cut, one incorporating one side surface another incorporating the other side surface and the third from the middle thickness of the board. The average of the results obtained with the three sets shall be taken as the strength value for the boards. Similar consideration shall apply to other tests as for sample representation.

11.2 Tests on Finished Machined Components

The manufacturer shall furnish a certificate to the purchaser that the finished component or part is made from compreg conforming to this standard for the particular type. If required by the purchaser, sample test pieces shall be tested from the same board, and test results thereon should be supplied.

11.3 Retests

If any piece fails to fulfil the test requirements specified under 11.1, a further set of duplicate samples on the basis prescribed under 11.1 shall be selected by the purchaser from the same batch for testing in the same manner. Test pieces prepared from these two further samples shall comply with the requirements, otherwise the batch shall be rejected.

12 MARKING

12.1 If compreg is supplied in board form each board, and if supplied in component form, each component, or if component is small, each package of the component shall be legibly and indelibly marked or stamped with the following particulars along with such other marks as the purchaser may stipulate at the time of placing a contract:

- a) Type and finish;
- b) Manufacturer's name, initials or recognized trade-mark;
- c) Year of manufacture; and
- d) Batch number.

IS 3513 (Part 3) : 1989

13 PACKING AND DELIVERY

13.1 The boards or components shall be delivered in a clean and dry condition and shall be suitably packed.

14 INFORMATION TO BE SUPPLIED BY THE PURCHASER

14.1 The purchaser shall supply the following information to the supplier with his order:

a) Number of boards or number of components;

- b) Type of material;
- c) Size and thickness;
- d) If components are required, full detailed drawings along with the tolerances and dimensions;
- e) Whether supply is to be platten finished, or machine finished;
- f) Whether supply is to be oil finished or varnish finished; and
- g) Any other special requirement.

ANNEX A

(Clause 2.1)

LIST OF INDIAN STANDARDS REFERRED IN THE STANDARD

IS No.	Title	IS No.	Title
IS 303 : 1975	Specification for plywood for general purposes (<i>second revision</i>)	Part 2 : 1986	Determination of specific gravity
IS 524 : 1983	Specification for varnish, finishing, exterior, synthetic, air drying (<i>second revision</i>)	Part 8 : 1986	Determination of compressive strength parallel to grain
IS 525 : 1968	Specification for varnish finishing, exterior and general purposes (<i>first revision</i>)	Part 9 : 1986	Determination of compressive strength perpendicular to grain
IS 707 : 1976	Glossary of terms applicable for timber technology and utilization (<i>second revision</i>)	Part 11 : 1986	Determination of shear strength parallel to grain
IS 848 : 1974	Specification for synthetic resin adhesives for plywood (phenolic and aminoplastic)	IS 1734	Methods of test for plywood (<i>second revision</i>)
IS 1586 : 1988	Method for Rockwell hardness test for metallic material (Scales A-B-C-D-E-F-G-H-K) (<i>second revision</i>)	Part 9 : 1983	Determination of tensile strength
IS 1708	Methods of testing of small clear specimens of timber (<i>second revision</i>)	IS 1998 : 1962	Methods of test for thermosetting synthetic resin bonded laminated sheets
Part 1 : 1986	Determination of moisture content	IS 3513 (Part 1) : 1989	Specification for resin treated compressed wood laminates (compreg) : Part 1 For electrical purposes
		IS 3513 (Part 4) : 1966	Specification for high and medium density wood based laminates (compreg) : Part 4 Sampling and tests (<i>under revision</i>)

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Amendments Issued Since Publication

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